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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

#14 Appeal Brief RT 9/11/02

In re Application of: Satoshi NAKAMURA)
) Group Art Unit: 2835
Application No.: 09/818,686)
) Examiner: Boris L. Chervinsky
Filed: March 28, 2001)
)
For: PRINTED WIRING BOARD HAVING)
HEAT RADIATING MEANS AND)
METHOD OF MANUFACTURING THE)
SAME)

Commissioner for Patents
Washington, D.C. 20231

APPELLANT'S BRIEF UNDER 37 C.F.R. § 1.192

This brief is in furtherance of the Notice of Appeal (Paper No. 12), filed in the above-identified patent application on July 19, 2002. A fee of $310.00 required under 37 C.F.R. §1.17(c) is being filed concurrently herewith. The period for filing this brief extends through September 19, 2002.

This brief is transmitted in triplicate.

1. The Real Party in Interest

The real party in interest in this appeal is ROHM CO., LTD, Japan.

2. Related Appeals and Interferences

Appellant is not aware of any other appeals or interferences that will directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

3. Status of Claims in Application

The status of the claims is as follows upon filing of this Appeal Brief:

Claims canceled: 2-5, 8, 9 and 14
Claims withdrawn from consideration but not canceled: None
Claims pending: 1, 6, 7, 10-13 and 15-22
Claims allowed: None
Claims rejected: 1, 6, 7, 10-13 and 15-22.

The claims on appeal are 1, 6, 7, 10-13 and 15-22.

4. The Status of Amendments

Appellant filed an Amendment under 37 C.F.R. § 1.116 (Paper No.___) on June 10, 2002 in response to the Final Office Action (Paper No. 6) dated March 20, 2002. The Amendment under 37 C.F.R. § 1.116 proposed to amend claims 6 and 15, and to cancel claims 4 and 5 without prejudice or disclaimer. On June 19, 2002, the Examiner issued an Advisory Action (Paper No. 11) which indicated that the Amendment under 37 C.F.R. § 1.116 was not entered but did not give a reason. On July 10, 2002, the Examiner issued a Supplemental Advisory Action (also labeled as Paper No. 11) which indicated that the Amendment under 37 C.F.R. § 1.116 would be entered upon filing an appeal. Therefore, Appellant believes that the Amendment under 37 C.F.R. § 1.116 has been entered.

5. Summary of the Invention

Appellant's invention relates to a printed wiring board incorporating an electronic component and having a heat radiating element capable of effectively radiating heat generated from the electronic component. The claims on appeal are set forth in the Appendix herein. Attention is particularly directed to page 7, line 3, to page 15, line 7, of the substitute specification submitted on February 27, 2002 and to Figures 1-6.

In one aspect, Appellant's printed wiring board "A" includes an electronic component 1 mounted on a circuit board 2. The electronic component 1 is provided with a heat radiating plate 11 for conducting and radiating heat internally generated. The printed wiring board "A" includes a first heat radiating pattern 3a formed on a front surface 2a of the circuit board 2, and connected to the heat radiating plate 11 of the electronic component 1 by soldering. The printed wiring board "A" also includes a second heat radiating pattern 3b formed on a rear surface 2b of the circuit board 2 at a position corresponding to the electronic component 1, and a heat radiating element 4 mounted on the second heat radiating pattern 3b by soldering. The heat radiating plate 11 and the first radiating pattern 3a have the same size whereas the second heat radiating pattern 3b has a larger size than the first radiating pattern 3a or the heat radiating plate 11. In a preferred embodiment, the heat radiating element 4 is made of metal, and is provided, on a rear side thereof, with a plated layer 42 which is able to be brought into contact with the circuit board 2 and on a front side thereof, with a plurality of fins 40 for radiating heat. In addition, as shown in Fig. 4, a plurality of fins 40' for radiating heat form a corrugated cross-section being uniformly shaped in such a way that a long-length of a belt-shaped hoop material may be extruded and cut at prescribed length. Also, the first heat radiating pattern 3a and the heat radiating plate 11 may

be connected to each other via through-holes 5 which pass through the circuit board 2. The first heat radiating pattern 3a may be a common pattern of wiring patterns which constitute circuits formed on the circuit board 2. The second heat radiating pattern 3b may also be a common pattern of wiring patterns which constitute circuits formed on the circuit board 2. The fins 40 (40') of the heat radiating element 4 (4') may be designed to stand with respect to the circuit board 2.

In another aspect, Appellant's printed wiring board "A" includes the circuit board 2, the electronic component 1 mounted the circuit board 2, a heat radiating plate 11 for conducting heat internally generated, the first heat radiating pattern 3a for conducting heat formed at a position on a front surface 2a of the circuit board 2 corresponding to the electronic component 1, such that the heat radiating plate 11 of the electronic component 1 is connected to the first heat radiating pattern 3a by soldering, the second heat radiating pattern 3b for conducting heat formed at a position on a rear surface 2b of the circuit board 2 corresponding to the electronic component 1, the plated layer 42 to which the second heat radiating pattern 3b is soldered, and the heat radiating element 4 (4') mounted at a position corresponding to the electronic component 1 on the rear surface 2b of the circuit board 2, such that the heat radiating element 4(4') is mounted on the circuit board 2 via the plated layer 42. The second heat radiating pattern 3b has a larger area than that of the first heat radiating pattern 3a.

In a preferred embodiment, the plated layer 42 may contain tin or nickel. Moreover, the plated layer 42 may include a first layer containing nickel and a second layer containing tin. In addition, the heat radiating element 4 (4') is made of metal and includes a plurality of fins 40 (40') for radiating heat. The first heat radiating pattern 3a may be a common pattern of wiring

patterns which constitute circuits formed on the circuit board 2. The second heat radiating pattern 3b may also be a common pattern of wiring patterns which constitute circuits formed on the circuit board 2. The first heat radiating pattern 3a and the second heat radiating pattern 3b may be connected via at least one through hole 5, and an inner surface 5a of the through hole 5 is covered with a material such as copper foil, which allows the heat from the first heat radiating pattern 3a to be conducted to the second heat radiating pattern 3b instead of the printed wiring board "A".

6. Issues

The Examiner has rejected claims 4-7 under 35 U.S.C. §112, second paragraph, as being indefinite. However, in the Supplemental Advisory Action dated July 10, 2002, the Examiner indicated that Applicant's Amendment under 37 C.F.R. §1.116 filed on June 10, 2002 would be entered for purpose of appeal and all rejections under 35 U.S.C. §112, second paragraph, were overcome by the Amendment under 37 C.F.R. §1.116.

Further, the Examiner has rejected claims 1, 4, 5, 10-12 under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* (U.S. Patent No. 6,058,013) in view of *Hunninghaus et al.* (U.S. Patent No. 5,708,566), rejected claims 6, 7 and 13 under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* in view of *Hunninghaus et al.*, and further in view of *Miyagi et al.* (U.S. Patent No. 5,506,755), rejected claims 15 and 20-22 under U.S.C. §102(a) as being anticipated by *Christopher et al*, rejected claims 16-18 under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.*, and rejected claim 19 under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* in view of *Miyagi et al.*

7. Grouping of Claims

In as far as presented herein, claims 1, 6, 7, 10-12 and 13 stand or fall together, and claims 15-22 stand or fall together.

8. Arguments

(i) Rejections under 35 U.S.C. § 112, first paragraph

No claims are presently rejected under 35 U.S.C. § 112, first paragraph.

(ii) Rejections under 35 U.S.C. § 112, second paragraph

Claims 4-7 were rejected under 35 U.S.C. §112, second paragraph, as being indefinite. However, all rejections under 35 U.S.C. § 112, second paragraph, were overcome by Appellant's Amendment under 37 C.F.R. §1.116 filed on June 10, 2002, as indicated by the Examiner's Supplemental Advisory Action dated July 10, 2002.

(iii) Rejections under 35 U.S.C. §103 of claims 1, 4-7 and 10-13

Claims 1, 4, 5, 10-12 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* in view of *Hunninghaus et al.* Claims 6, 7 and 13 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* in view of *Hunninghaus et al.*, as applied to claim 1, and further in view of *Miyagi et al.* Appellant has canceled claims 4 and 5 without prejudice or disclaimer in the Amendment under 37 C.F.R. §1.116 filed on June 10, 2002. Appellant respectfully submits that claims 1, 6, 7, 10-13 are allowable for at least the following reasons.

Summary of *Christopher et al.*

Christopher et al. discloses a heat-sinking structure where heat produced from a heat-generating component is conducted away from an inner surface to an outer surface. As shown in Fig. 2 of *Christopher et al.*, for example, heat-generating components 119 and 225 are coupled to their respective pedestal surfaces 113'' and 223 via a substrate 201. The substrate 201 is coupled to thermally-conductive material 117 of the pedestal surface 113'' with a first solder connection 121 and the heat-generating component 119 is coupled to the substrate 201 with a second solder connection 203. A metalized via 205 thermally connects the first solder connection 121 and the second solder connection 203. In this configuration the substrate 201 is coupled to the thermally-conductive material 222 of the pedestal surface 223 with a third solder connection 121' and the heat-generating component 225 is coupled to the substrate 201 with a fourth solder connection 227. The substrate 201 has another metalized via 229 disposed therethrough thermally connecting the third solder connection 121' and the fourth solder connection 227. As shown in Fig. 2, the first solder connection 121 has the same size as the second solder connection 203 and the third solder connection 121' has the same size as the fourth solder connection 227. In addition, *Christopher et al.* does not teach or suggest that these solder connections 121, 203, 121' and 227 should be different in size.

Summary of *Hunninghaus et al.*

Hunninghaus et al. discloses an electronic module containing an electronic device capable of generating large quantities of heat and a thermal dissipation structure for dissipating the heat. As shown in Figs. 1 and 2, a circuit substrate 12 has an upper device surface 32 and a lower mounting surface 38. A plurality of thermal vias 36 are formed in the circuit substrate 12.

Each thermal via includes a plating layer 44 which has an upper part overlying a portion of the upper device surface 32 and a lower part overlying a portion of the lower mounting surface 38. The alignment of thermal attachment pads 20 with the thermal vias 36 effectively transfers heat generated by electronic components on the upper device surface 32 of the circuit substrate 12 to a mounting plate 14. It is shown in Figs. 1 and 2 that the upper part of the plating layer 44 has the same size as the lower part of the plating layer 44. Also, *Hunninghaus et al.* does not teach or suggest that the upper part of the plating layer 44 should have a different size as compared to the lower part of the plating layer 44.

In addition, a solder mask 25 is formed on the lower mounting surface 38 of the circuit substrate 12. The solder mask 25 is a discontinuous layer over the lower mounting surface 38 and contains openings around the plating layer 44 of each thermal via 36 to permit the attachment of thermal vias 36 to thermal attachment pads 20. In other words, the solder mask 25 is arranged separated from the plating layer 44, and is not part of the plating layer 44.

Summary of *Miyagi et al.*

Miyagi et al. discloses a multi-layer wiring substrate. As shown in Fig. 1, the multi-layer wiring substrate includes an aluminum nitride ceramic substrate 1, a multi-layer wiring part 2 having an electronic insulating layer 2a of an organic polymer, a die pad 2c for mounting thereon an electrode part 3, and a plurality of thermal vias 4 of a column shape for effectively dissipating heat generated in the mounted electric part 3. One end of the thermal via 4 is connected to the die pad 2c, and the other end of the thermal via 4 is connected to a heat radiating fin portion 7 including a plurality of fins. *Miyagi et al.* does not teach or suggest a first heat radiating pattern and a second heat radiating pattern which are different in size.

Claims 1, 4, 5 and 10-12

With respect to independent claim 1, Appellant respectfully submits that *Christopher et al.* and *Hunninghaus et al.*, whether taken singly or combined, do not teach or suggest the claimed combination, including at least "said second heat radiating pattern has a larger area than that of said first heat radiating pattern."

The Final Office Action alleges that although *Christopher et al.* fails to disclose that the second radiating pattern has a larger area than the first heat radiating pattern, *Hunninghaus et al.* discloses "the circuit board having heat-radiating pattern 44 on upper side and underside of the board and the underside radiating pattern having larger area than the upper side." Applicant respectfully disagrees. As shown in Fig. 1 and as discussed at lines 29-32, column 3 of *Hunninghaus et al.*, a plating layer 44 overlies a portion of upper device surface 32 and lower mounting surface 38 of circuit substrate 12 in proximity to opening 46. Further, as shown in Fig. 1 and as discussed at lines 42-47, column 3 of *Hunninghaus et al.*, a solder mask 25 is formed on a lower mounting surface 38 of circuit substrate 12 and **is a discontinuous layer over mounting surface 38 and contains openings around the plating layer 44 of each thermal via** to permit the attachment of thermal vias 36 to thermal attachment pads 20. As shown in Figs. 1 and 2 of *Hunninghaus et al.*, the under side radiating pattern of the plating layer 44 has the same area as the upper side radiating pattern of the plating layer 44. Therefore, *Hunninghaus et al.*, fails to teach or suggest at least "said second heat radiating pattern has a larger area than that of said first heat radiating pattern" as recited in independent claim 1.

As discussed above, *Christopher et al.* fails to disclose the claimed combination, at least in which "said second heat radiating pattern has a larger area than that of said first heat radiating

pattern." Furthermore, *Hunninghaus et al.*, does not overcome the deficiencies of *Christopher et al.* Thus, even assuming that *Christopher et al.* and *Hunninghaus et al.* can be properly combined, which we disagree, the combination of these two references still does not teach or suggest that "said second heat radiating pattern has a larger area than that of said first heat radiating pattern" as recited in independent claim 1.

As a result, Appellant respectfully asserts that the rejection of independent claim 1 under 35 U.S.C. §103(a) should be withdrawn because *Christopher et al.* and *Hunninghaus et al.*, whether taken singly or combined, do not teach or suggest at least the above cited feature of independent claim 1, as amended. Furthermore, Appellant has canceled claims 4 and 5 without prejudice and disclaimer. Appellant respectfully asserts that dependent claims 10-12 are allowable at least because of their dependence upon independent claim 1 and for the reasons set forth above.

Claims 6, 7 and 13

As discussed above, *Christopher et al.* and *Hunninghaus et al.*, whether taken singly or combined, do not teach or suggest the claimed combination, including at least the limitation of "said second heat radiating pattern has a larger area than that of said first heat radiating pattern." Furthermore, *Miyagi et al.* does not overcome the deficiencies of *Christopher et al.* and *Hunninghaus et al.* Thus, none of *Christopher et al., Hunninghaus et al.* and *Miyagi et al.*, even assuming they can be properly combined (which we disagree), teaches or suggests that "said second heat radiating pattern has a larger area than that of said first heat radiating pattern" as recited in independent claim 1.

Therefore, Appellant respectfully asserts that the rejection of dependent claims 6, 7 and 13 under 35 U.S.C. §103(a) should be withdrawn at least because of their dependence upon independent claim 1 and for the reasons set forth above.

(iv) Rejections under 35 U.S.C. § 102 of claims 15 and 20-22

Claims 15 and 20-22 stand rejected under 35 U.S.C. §102(a) as being anticipated by *Christopher et al.* Appellant respectfully submits that claims 15 and 20-22 are allowable for at least the following reasons.

Christopher et al. has been summarized above with respect to the rejections under 35 U.S.C. §103 based on *Christopher et al.* and *Hunninghaus et al.* With respect to independent claim 15, as newly-amended, Appellant respectfully submits, for the similar reasons as set forth above, that *Christopher et al.* does not teach or suggest the claimed combination, including at least "said second heat radiating pattern has a larger area than that of said first heat radiating pattern."

Appellant respectfully asserts that the rejection under 35 U.S.C. §102(a) should be withdrawn because *Christopher et al.* does not teach or suggest each feature of independent claims 15. Furthermore, Appellant respectfully asserts that dependent claims 20-22, are allowable at least because of their dependence upon newly-amended independent claim 15 and for the reasons set forth above.

(v) Rejections under 35 U.S.C. §103 of claims 16-19

Claims 16-18 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.*, and claim 19 stands rejected under 35 U.S.C. §103(a) as being unpatentable over *Christopher et al.* in view of *Miyagi et al.* The rejections are respectfully traversed for the following reasons.

As discussed above, *Christopher et al.* fails to disclose the claimed combination, including at least the limitation of "said second heat radiating pattern has a larger area than that of said first heat radiating pattern." Furthermore, *Miyagi et al.* does not overcome the deficiencies of *Christopher et al.* Thus, neither *Christopher et al.* nor *Miyagi et al.*, even assuming they can be properly combined (which we disagree), teaches or suggests that "said second heat radiating pattern has a larger area than that of said first heat radiating pattern" as recited in amended independent claim 15.

Therefore, Appellant respectfully asserts that the rejection of dependent claims 16-19 under 103(a) should be withdrawn at least because of the dependence of these claims upon claim 15, and the reasons set forth above.

(vi) Other Rejections

No claims are presently rejected under grounds other than those referred to above.

* * * * *

In view of the foregoing, Appellant respectfully requests the reversal of the Examiner's rejections and the allowance of the pending claims. Please charge the fee of $310.00 required under 37 C.F.R. §1.17(c) to our Deposit Account No. 50-0310. If there are any other fees due in

connection with the filing of this Appellant's Brief, please charge the fees to our Deposit Account No. 50-0310. If a fee is required for an extension of time under 37 C.F.R. § 1.136 not accounted for above, such an extension is requested and the fee should also be charged to our Deposit Account No. 50-0310.

Respectfully submitted,

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By: _____
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Dated: September 10, 2002

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9. Appendix

The text of the claims involved in the appeal are:

1. (Amended) A printed wiring board with an electronic component mounted on a circuit board in which the electronic component is provided with a heat radiating plate for conducting heat internally generated, comprising:

a first heat radiating pattern for conducting heat which is formed on a front surface of said electronic component, and connected to said heat radiating plate of the electronic component by soldering;

a second heat radiating pattern for conducting heat which is formed on a rear surface of said circuit board at a position being opposed to said electronic component, and

heat radiating means mounted on said second heat radiating pattern by soldering at a position being opposed to the electronic component, wherein

said heat radiating plate and said first radiating pattern have a same area whereas said second heat radiating pattern has a larger area than that of said first radiating pattern or said heat radiating plate.

6. (Twice Amended) The printed wiring board according to claim 1, wherein said heat radiating means is made of metal, and is provided, on a rear side thereof, with a plated layer which is able to be brought into contact with said circuit board and on a front side thereof, with a plurality of fins for radiating heat.

7. (Amended) The printed wiring board according to claim 6, wherein said plurality of fins for radiating heat forms a corrugated cross-section being uniformly shaped in such a way that a long-length of a belt-shaped hoop material is extruded and cut at prescribed length.

10. (Amended) The printed wiring board according to claim 1, wherein said first heat radiating pattern and said heat radiating plate are connected to each other via through-holes which pass through said circuit board.

11. (Amended) The printed wiring board according to claim 1, wherein said first heat radiating pattern is a common pattern of wiring patterns which constitute circuits formed on said circuit board.

12. (Amended) The printed wiring board according to claim 1, wherein said second heat radiating pattern is a common pattern of wiring patterns which constitute circuits formed on said circuit board.

13. (Amended) The printed wiring board according to claim 6, wherein said fins of said heat radiating means are designed to stand with respect to the circuit board.

15. (Amended) A printed wiring board, comprising:

a circuit board;

an electronic component mounted on said circuit board and including a heat radiating plate for conducting heat internally generated;

a first heat radiating pattern for conducting heat formed at a position on a front surface of said circuit board corresponding to said electronic component, such that the heat radiating plate of said electronic component is connected to said first heat radiating pattern by soldering;

a second heat radiating pattern for conducting heat formed at a position on a rear surface of said circuit board corresponding to said electronic component;

a plated layer to which said second heat radiating pattern is soldered; and

heat radiating means mounted at a position corresponding to said electronic component on the rear surface of said circuit board, such that said heat radiating means is mounted on said circuit board via said plated layer, wherein

said second heat radiating pattern has a larger area than that of said first heat radiating pattern.

16. The printed wiring board according to claim 15, wherein said plated layer contains tin.

17. The printed wiring board according to claim 15, wherein said plated layer contains nickel.

18. The printed wiring board according to claim 15, wherein said plated layer includes a first layer containing nickel and a second layer containing tin.

19. The printed wiring board according to any one of claims 15 to 17, wherein said heat radiating means is made of metal and includes a plurality of fins for radiating heat.

20. The printed wiring board according to claim 15, wherein said first heat radiating pattern is a common pattern of wiring patterns which constitute circuits formed on said circuit board.

21. The printed wiring board according to claim 15, wherein said second heat radiating pattern is a common pattern of wiring patterns which constitute circuits formed on said circuit board.

22. The printed wiring board according to claim 15, wherein said first heat radiating pattern and said second heat radiating pattern are connected via at least one through hole in heat, and an inner surface of the through hole is covered with a material having a specific heat smaller than that of the printed wiring board.